

MAT 121-G13

Practice Test 1

1. State whether the relations below represent a function (yes/no). If not, why? State the domain and range of each function. State whether the function is one to one, if it is, state the domain and range of the inverse.

$$f = \{(2, -1), (-3, -1), (6, 4), (-3, -1), (1, 2)\}$$

$$g = \{(3, 1), (-2, 4), (1, 3), (2, 5)\}$$

2. Determine whether the equation  $y - 9 = (x - 2)^2$  defines  $y$  as a function of  $x$ . If it does not, show/explain why not, either by a general argument, or by finding an  $x$ -value in the domain that corresponds to more than one  $y$ -value in the range.

Now try  $(y - 9)^2 = x - 2$

3. Find the inverse function of  $f(x) = 2x^3 - 7$  by reversing the composition.

4.) Let  $f(x) = x^2 + 5$ .

a. Simplify the difference quotient  $\frac{f(x+h)-f(x)}{h}$ . You may use the alternative version of this given by  $\frac{f(x)-f(c)}{x-c}$ .

b. find the average rate of change of  $f$  from  $x = -1$  to  $x = 1$ .

5. Let  $f(x) = \sqrt{2x+4}$  and  $g(x) = 4x - 2$ .

a. Determine each of the following functions and state domain of each.

i.  $(f + g)(x)$

ii.  $(f - g)(x)$

iii.  $(f \cdot g)(x)$

iv.  $\left(\frac{f}{g}\right)(x)$

v.  $\left(\frac{g}{f}\right)(x)$

6. Determine algebraically whether the following functions are even, odd, or neither.

a.  $h(x) = \frac{x^4 - x^2 - 3}{x^2}$

b.  $\frac{\sqrt{x^2 + x^3} - 5}{x^5 - x}$

7. Determine whether each function is one to one.

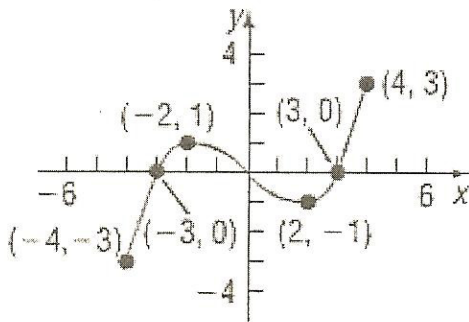
i)  $h(x) = 3x - 7$

ii)  $g(x) = \frac{x - 4}{x + 1}$

iii)  $v(x) = 3x^2 - 2$

8. Find functions  $f$  and  $g$  so that  $(f \circ g)(x) = H$ , given that  $H = (2x - 3)^4$ .

9. Use the graph of the function  $f$  below to answer the following questions:



a. The intercepts  
(Express answers as ordered pairs.)

i. (3 pts)  $x$ -intercept(s):

ii. (3 pts)  $y$ -intercept(s):

b. (3 pts) The domain and range:

c. Intervals of increase/decrease:

i. (3 pts)  $f$  is increasing on \_\_\_\_\_.

ii. (3 pts)  $f$  is decreasing on \_\_\_\_\_.

d. Extrema:

i. (3 pts)  $f$  has local minimum of \_\_\_\_\_ at \_\_\_\_\_.

ii. (2 pts)  $f$  has a local maximum of \_\_\_\_\_ at \_\_\_\_\_.

10. Graph each of the following functions using techniques of shifting. Compressing, and stretching, and/ or reflecting. Start with the graph of the basic function and show all stages in separate sketches. Track 3 key points through the transformations and show the  $y$ -intercept in the final sketch.

a.  $g(x) = -\sqrt{x + 3} + 5$

b.  $g(x) = 2(x - 1)^2 - 7$

c.  $h(x) = 3|-x - 2| + 2$

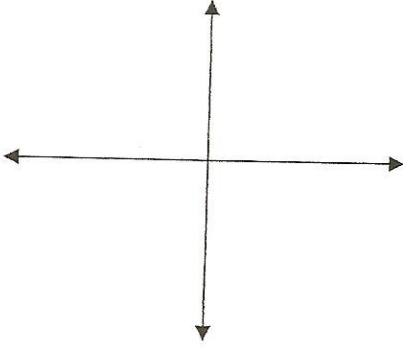
d.  $f(x) = \sqrt{3-x} - 1$

e.  $j(x) = -2(x-2)^3 + 2$

f.  $f(x) = -4(2-x)^3 - 5$

11. Let  $f(x) = \frac{4}{5}x - 6$

- a. Determine the slope and y-intercept.

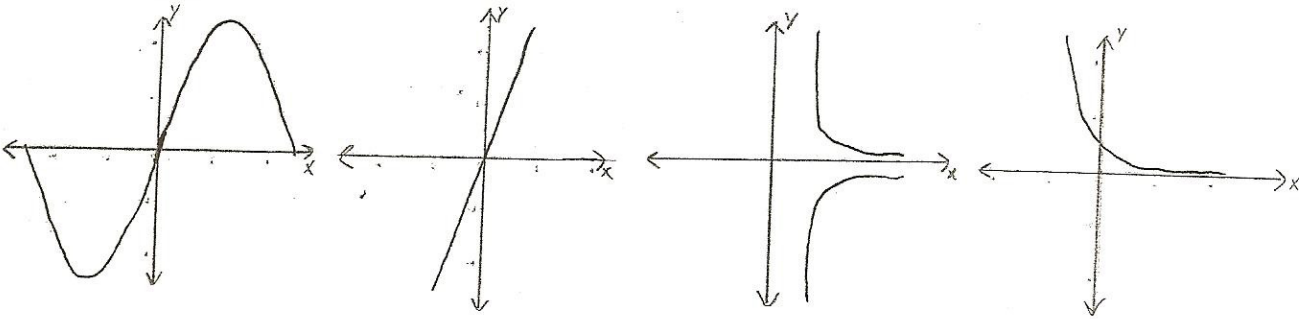


- b. Use the slope and y-intercept to graph  $f$  here.

- c. Determine the average rate of change of  $f$ .

- d. Is  $f$  increasing, decreasing or constant?

12. Determine which of the following are one-to-one. Indicate by writing "Yes" or "No" on the graphs. State which one isn't a function.



13. For  $f(x) = 3x$ , and  $g(x) = 2x^2 - 1$ , find:

a.  $(f \circ f)(2)$

b.  $(f \circ g)(2)$

c.  $(g \circ g)(2)$

14. For  $f(x) = \frac{1}{x+3}$  and  $g(x) = \frac{2}{x} + 3$ , find  $(f \circ g)(x)$  and its domain.

15. The velocity  $v$  of a falling object is directly proportional to the time  $t$  of the fall. If after 4 seconds, the velocity is 88 feet per second, what will the velocity be after 6 seconds?

16. Sketch the graph of  $f(x) = \begin{cases} x + 3 & \text{if } -2 \leq x \leq 1 \\ 5 & \text{if } x = 1 \\ -2x + 2 & \text{if } x > 1 \end{cases}$ .

Include all intercepts.  
State the domain and  
range in both interval  
notation and set-builder notation.



17. At the corner Shell station, the revenue  $R$  varies directly with the number  $g$  of gallons of gasoline sold. If the revenue is \$23.40 when the number of gallons sold is 12, find the linear function that relates revenue  $R$  to the number of gallons  $g$  of gasoline. Then find the revenue  $R$  when the number of gallons of gasoline is 10.5.

18. Let  $f(x) = x^3$ . Find  $f^{-1}(x)$ , and graph both  $f$  and  $f^{-1}$  on the same coordinate axes

19. Let  $f(x) = \frac{2x-3}{x+4}$ . Find  $f^{-1}(x)$  by using the switch-and-solve method. Check your answer.